A COMPARISON OF MOSQUITOES CAPTURED WITH AVIAN BAIT AND WITH HUMAN BAIT[1]

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INTRODUCTION

During the years 1942 and 1943 extensive captures of mosquitoes were made in the County of Teresópolis, State of Rio de Janeiro, as part of ecologic investigations of animals relating to jungle yellow fever (1). These captures were designed to determine changes in the abundance of mosquitoes during the year, and were made in the same places during a period of about 168 hours each month. The collections were made at three vegetational levels with avian bait, and on the ground with human bait. The aim of this paper is to compare the behavior of the various species in respect to avian and human bait. The comparison of captures at different vegetational levels has been published (2).

DESCRIPTION OF THE LOCATION OF CAPTURES

The County of Teresópolis is situated on the top of the coastal mountains between the Serra dos Orgãos and the Serra da Estrela at an altitude of approximately 800 meters. The region consists of cultivated valleys and forested hills. The climate is subtropical. The average rainfall for the years 1932 and 1943 was 1655 mm., and the average temperature was 18.8° C. The coldest and driest months are June, July, and August; the rainiest months are October, November, and December; the hottest months are January and February.

The captures were made in forests on two estates about 10 kilometers apart. The localities have the following characteristics:

Fazenda Boa Fé.—The captures were made in a second-growth forest approximately 70 years of age upon the top of a hill some 60 meters high. The trees are about 30 meters high and have some bromeliads and lianas on the branches. Under these trees the vegetation, although thick, is not impenetrable. Palms and two sizes of bamboos are present in the undergrowth. The ground is dry, without springs, but with a small stream at the base of the hill in the valley. The valley below is cultivated.

Fazenda Comarí.—The captures were made in a forest located in a small valley between some hills about 50 meters high. The forest is virgin and has tall trees and many bromeliads and lianas

[1] The work on which these observations are based was done under the auspices of the Servico de Estudos e Pesquisas Sobre a Febre Amarela (Yellow Fever Research Service) which is maintained jointly by the Ministry of Education and Health of Brazil and the International Health Division of The Rockefeller Foundation.

Although palms are common, bamboos are present only in a few places opened up by windfalls. The forest is open below, but the canopy shuts out nearly all light. The ground is moist, and there are some temporary springs which flow only in the wet season.

METHODS

Two types of captures were made. Using about 10 individuals of several avian species as bait in a "Shannon" one-compartment type of trap (3), mosquitoes were captured at three vegetation levels, indicated as A, B, and C. In addition captures with human bait without a trap were made on the ground. The captures were carried out by three men working in 8-hour shifts during all hours of the day and night. Every hour on the hour, the Shannon traps were visited to collect the mosquitoes therein. From the half hour to the hour, captures were made with human bait. The captures were interrupted only when the rainfall was very heavy and were resumed as soon as the rain stopped. Each trap contained about 10 birds of the species *Columbigallina talpacoti*, *Molothrus bonariensis*, *Sicalis flaveola*, and *Zonotrichia capensis;* as far as the supply of birds permitted, an equal number of each species was kept in each trap.

Location and conditions of the traps

Fazenda Boa Fé.—The location of the traps was on a small level area on top of the hill fairly well shaded by trees. The surrounding vegetation was disturbed as little as possible during the investigations. Trap A was placed on the ground between trees and bushes in fairly thick vegetation. There was no bamboo within 25 meters. The captures with human bait were made on the ground in vegetation similar to that near trap A. The location was covered at all times by a tarpaulin in order to give constant shade and protection from the rain.

Fazenda Comarí.—The place where the traps were placed is at the base of a hill, in an area which has several temporary springs. Trap A was placed on the ground among saplings and bushes and under a thick cover of trees. There was some bamboo about 30 meters away. The captures with human bait were made on the ground at a place slightly up hill from the location of trap A. The vegetation, though similar to that surrounding trap A, was somewhat drier and more open.

COMPARISON OF AVIAN AND HUMAN BAIT

A consideration of the number of mosquitoes captured in trap A and with human bait (H) in the two localities permits a comparison of the preferences in feeding habits. Table 1

shows the ratio between the number of individuals captured with human bait and the number captured in trap A. Species of which less than five individuals were captured in both locations are omitted. The comparison of the ratios indicates that there are great variations among the species in their preferences for bait. Some species, such as *Trichoprosopon reversus*, *Trichoprosopon pallidiventer*, *Phoniomyia pilicauda*, and *Wyeomyia bourrouli* show a marked preference for human bait. Other species such as *Culex* spp., *Trichoprosopon compressum*, *Wyeomyia brucei*, and *Psorophora discrucians* show a preference for avian bait. It is interesting to note the difference in preferences between the two species *Psorophora ferox* and *Psorophora discrucians*. The close similarity of the ratios of the species of the genus *Aedes* suggests that the species are similar in their preferences.

DISCUSSION

Comparison of the captures with human bait and with avian bait must be made with due caution. It should be noted that the captures with avian bait were made by a trap and the mosquitoes were collected every hour. It is possible, therefore, that individuals of some species habitually fly out, although the observations of Shannon (3) and of the men who made the captures indicate that the habits of the species are similar. It is known (unpublished data) that in such a trap more mosquitoes are captured at intervals of 15 minutes than at intervals of 2 hours. It will be assumed therefore that a constant proportion of each species escape from the trap. In contrast, the captures with human bait are continuous; the man captures every mosquito which alights. But the voracious aedines attack more readily than the wary sabethines, so that when aedines are abundant the sabethines are captured in proportionally lower numbers. However, it is still possible to compare aedine with aedine and sabethine with sabethine. Even more important than the difference in the method of collecting is the fact that the vegetation was not identical at both locations. Nevertheless, it is considered that the differences were not sufficient to invalidate comparison of related species among themselves.

The literature reveals that extensive investigations of bait preferences, especially those of anopheline mosquitoes, have been made. Some studies (4) show that mosquitoes are attracted by the presence of humans, since the mosquitoes are more abundant in inhabited houses than in those that are uninhabited. Other investigations (5) (6) (7) (8) compare the relative attractiveness of individuals or species to anophelines. Still other studies (5) (9), by means of precipitin tests of the blood in the females, determine the feeding habits of the anophelines. Another method in investigation (10) (11) showed

TABLE I

Ratios of Mosquitoes Captured with Avian and with Human Bait

Species	Fazenda Boa Fé			Fazenda Comarí		
	H	A	H/A	H	A	H/A
Trichoprosopon reversus	243	12	20.16	1183	33	35.82
Trichoprosopon pallidiventer	91	5	18.20	173	19	9.10
Phoniomyia pilicauda	386	28	13.78	922	29	31.79
Wyeomyia bourrouli	89	8	11.12			
Wyeomyia mystes	142	17	8.35	92	5	18.40
Trichoprosopon fluviatilis				260	16	16.25
Psorophora ferox	1390	168	8.27			
Taeniorhynchus chrysonotum	81	10	8.10			
Sabethes lutzianus	93	13	7.15			
Sabethes melanonymphe	35	5	7.00			
Wyeomyia confusa	3104	455	6.82			
Aedes serratus	2352	375	6.27			
Aedes scapularis	679	118	5.75			
Trichoprosopon digitatum	183	36	5.08			
Sabethes purpureus	26	6	4.33			
Psorophora discrucians	96	25	3.84			
Wyeomyia brucei	214	63	3.39	156	24	6.50
Trichoprosopon compressum	12	11	1.09			
Culex spp.	693	656	1.05	71	23	3.08

that the blood of different species of vertebrates differs in its effect on egg production by mosquitoes. The application of such investigations to malaria has been summarized (12). In northern Brazil (13) it was concluded that deer and aguti attracted the most *Psorophora* but that paca attracted the most *Aedes*. *Culex* choose man more than twice as often as either deer or aguti. However, since in these studies there is no consideration of environmental conditions at the times of capture, the totals are not comparable.

The data here presented suggest caution in the interpretation of the absolute abundance of species in various stations by showing that it is necessary to know something about the preference for bait. For example, *P. ferox* in comparison with *P. discrucians* prefers human bait. Captures made only with human bait, therefore, may be misleading by producing a greater number of the former. In reality *P. discrucians* might be of great abundance but appear in the captures in small numbers.

SUMMARY

Extensive captures of mosquitoes in Teresópolis, Rio de Janeiro, make possible the comparison of related species among themselves in respect to preferences for avian or human bait.

Species, even within the same genus, differ one from another in their preference for avian as compared with human bait.